## I – Problem Statement Title (04-GS093)

**Development of an Automated Vertical Clearance Measuring Device for Highway Structures**

## II – Research Problem Statement

**Question: How can the department utilize commercially available vertical clearance measuring systems to replace current manual measuring procedures to measure bridge vertical clearance?**

## III – Objective

This research would develop software that would enable commercially available vertical clearance measurement systems to print out Vertical clearance diagrams in a standard Caltrans format.

The research would also explore the potential for these systems to interface directly with the Traffic Operations permit database.

## IV – Background

Currently, vertical clearances are measured manually with the use of traffic control. This process subjects staff to traffic hazards and causes traffic delays and hazards to the traveling public. There is also a delay in obtaining information due to the need to schedule crews and approve traffic management plans. Due to the often limited traffic breaks and the hurried pace of collecting the measurements, the measurements may lack accuracy.

These measurements are then manually plotted out as a standard clearance iagram and forwarded to Traffic operations. The data is then manually input into the Traffic Operations database.

Commercial units are available that can take measurements at highway speeds. They have data output software for the logging and storage of the collected data. A measurement is required in each lane in both directions of travel.

## V – Statement of Urgency and Benefits

### A. Support of the Departments Mission/Goals:
### (Improving Mobility: Safety, Reliability, Performance and Productivity)

Safety – An automated VC measuring system will increase both worker safety and decrease work zone accidents.

Reliability – An automated system will increase the frequency and accuracy of VC measurements. Travel delays due to measuring operations and work zone accidents will be decreased.

Performance - Improvements in the over height permits process will be realized.

Productivity – Improvements in the VC measuring process will lead to an increase in efficiency in the movement of over height loads. It will also reduce the staff time required for the collection and processing of VC information.

**A. Return on Investment:**

Success with this project will provide a safer environment for both the traveling public and Caltrans employees. It will also open the door for timely updates to the traffic operations database. Periodically, there is a need to check all clearances statewide as was done in 2000. Implementation of this research will make this process much more efficient in the future.

An automated system would be operated by just two engineers at a cost of approximately $900/day. Compared to current cost of $6000/day, a cost savings of approximately $5000/day will be realized. The number of days to recoup the cost of this research would be 40 days.

More importantly than the dollars saved is the safety increase of the operations. We will have just two people operating a vehicle rather than 6 persons on the roadway plus all the traffic control staff. We will also be able to collect data when requested rather than wait until often complex traffic controls can be set up.

Current costs to provide lane closures are approximately $2,500 per day and cost approximately $800 in staff time to set up. Engineering time is approximately $350 per day with six staff members required to collect all required measurements in each lane closure. CHP support is approximately $500 per day. A typical operation to measure vertical clearances is $6000/day. Once the data is returned to the office there is also staff time to draw up vertical clearance diagrams.

## VI – Related Research

Currently there is a VC research project ongoing at AHMCT of UC Davis. The scope of this project included gathering horizontal clearance data. This horizontal clearance date in not currently widely used by Caltrans for the routing of oversized loads. It is primarily gathered as a requirement of the National Bridge Inspection Standards. The inclusion of the horizontal measurements into the research has complicated the measuring and data processing process. The use of commercial units that have proven results will allow researchers to focus on strictly manipulating data rather than also developing a measuring system.

## VII – Deployment Potential

The anticipated deliverable is software that will translate the output of commercially available VC measuring systems into data that is readily usable by the Department.

The likelihood that the data output from commercially available system can be modified as described above is very high. I believe the likelihood that a system that can record measurements in various lanes and combine them into a single clearance diagram is very good.

Due to the complexities of implementing a statewide measuring program, the deployment potential for use as input into the statewide Traffic Operations database will likely be much less.

It should be noted that as long as the clearance diagram can be developed then the project will be a success. Currently this is the method of getting the VC data to traffic operations. Success at this level will allow insight as to how the system may later be used to input the data directly into the Traffic Operations Database.